

# Non Thermal Plasma Assisted Catalytic Reactor for CO<sub>2</sub> Methanation, Phase I

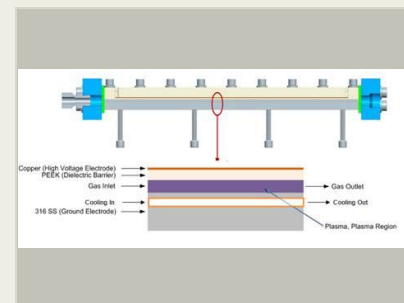
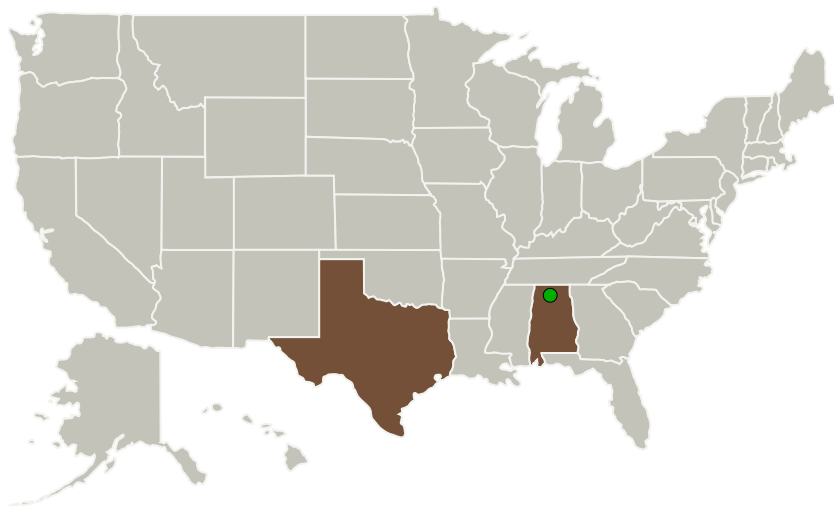
Completed Technology Project (2013 - 2013)



## Project Introduction

In situ production of methane as propellant and oxygen as life support consumables from the atmospheric CO<sub>2</sub> and water on Mars is a key enabling technology required for sustainable and affordable human exploration of Mars. Sabatier reaction for catalytic methanation of CO<sub>2</sub> with H<sub>2</sub> is a commercially well known process achieving conversions in excess of 99% at temperature of ~350°C. However, application of this technology for Mars missions requires significant improvements in terms of mass and durability of the Sabatier reactor. Conventional catalytic approaches are insufficient to address the catalyst durability issues and its tolerance to impurities such as H<sub>2</sub>S and halogenated compounds, which may be present in small quantities in Martian CO<sub>2</sub>. Lynntech proposes a novel low power, low temperature, impurity tolerant non thermal plasma assisted catalysis for the methanation of CO<sub>2</sub>. Lynntech will develop a multi-channel reactor design based on parametric study in Phase I. The Phase II of the project will build a full scale Sabatier reactor for NASA application.

## Primary U.S. Work Locations and Key Partners



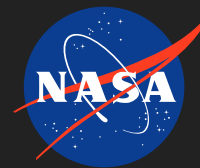
Non Thermal Plasma Assisted Catalytic Reactor for CO<sub>2</sub> Methanation

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Organizations Performing Work	Role	Type	Location
Lynntech, Inc.	Lead Organization	Industry	College Station, Texas
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Texas

## Project Transitions

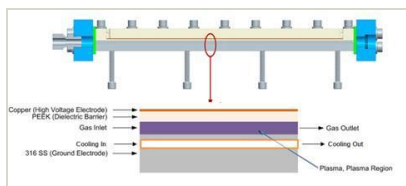
▶ **May 2013:** Project Start

✓ **November 2013:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140382>)

## Images



## Project Image

Non Thermal Plasma Assisted  
Catalytic Reactor for CO<sub>2</sub>  
Methanation

(<https://techport.nasa.gov/image/136214>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Lynntech, Inc.

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

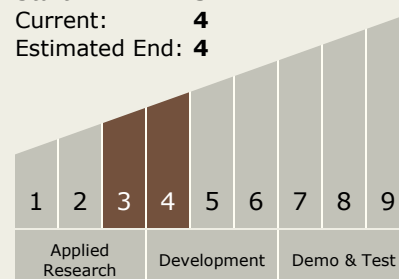
Carlos Torrez

## Principal Investigator:

Mahesh Waje

## Technology Maturity (TRL)

Start: **3**  
Current: **4**  
Estimated End: **4**



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## Technology Areas

### Primary:

- TX07 Exploration Destination Systems
  - └ TX07.1 In-Situ Resource Utilization
    - └ TX07.1.3 Resource Processing for Production of Mission Consumables

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System